① Solve $x^2+y^2=9$ for y $\qquad y=\pm\sqrt{9-x^2}$

② Take the derivative of the equation you found in a) and write the equation of the tangent line to the curve at $x=\frac{3\sqrt{2}}{2}$.

$y=\pm(9-x^2)^{\frac{1}{2}}$

$y'=\pm\frac{1}{2}(9-x^2)^{-\frac{1}{2}}\cdot -2x$

$\boxed{y'=\pm x(9-x^2)^{-\frac{1}{2}}}$

$x=\frac{3\sqrt{2}}{2}$

$y=\pm\sqrt{9-\left(\frac{3\sqrt{2}}{2}\right)^2} \quad =\pm\frac{3\sqrt{2}}{2}$

$y=\pm 1\left(x-\frac{3\sqrt{2}}{2}\right)\pm\frac{3\sqrt{2}}{3}$

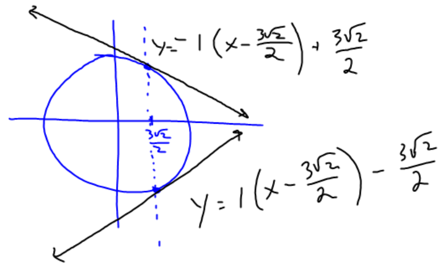
$y'\left(\frac{3\sqrt{2}}{2}\right)=\pm\frac{3\sqrt{2}}{2}\left(9-\left(\frac{3\sqrt{2}}{2}\right)^2\right)^{-\frac{1}{2}}$

$\pm\frac{3\sqrt{2}}{2}\left(9-\frac{18}{4}\right)^{-\frac{1}{2}}$

$\pm\frac{3\sqrt{2}}{2}\left(\frac{36-18}{4}\right)^{-\frac{1}{2}}$

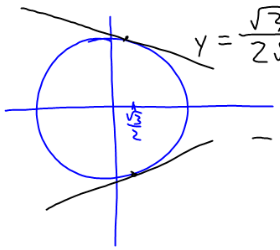
$\pm\frac{3\sqrt{2}}{2}\left(\frac{18}{4}\right)^{-\frac{1}{2}}$

$\frac{2}{3\sqrt{2}}$ $\quad =\pm 1$



③ Find $\frac{dy}{dx}$ of $x^2+y^2=9$ implicitly and write the equation of the tangent at $x=\frac{\sqrt{3}}{2}$ $\qquad y=\pm\sqrt{8.25}$

$2x+2y\frac{dy}{dx}=0 \qquad \frac{dy}{dx}=\frac{-2x}{2y}=-\frac{x}{y} \qquad \sqrt{\frac{33}{4}}=\frac{\sqrt{33}}{2}$



$y=\frac{\sqrt{3}}{2\sqrt{8.25}}\left(x-\frac{\sqrt{3}}{2}\right)+\sqrt{8.25}$

$-\frac{\sqrt{3}}{2\sqrt{8.25}}\left(x-\frac{\sqrt{3}}{2}\right)-\sqrt{8.25}$

57. $xy + 2x - y = 0$ $\Rightarrow$ $x\frac{dy}{dx} + y + 2 - \frac{dy}{dx} = 0$

parallel to $2x + y = 0$

$\frac{dy}{dx}(x-1) = -y - 2$

$\frac{dy}{dx} = \frac{-y-2}{x-1}\left(\frac{(-1)}{(-1)}\right) = \frac{y+2}{1-x}$

$y = -2x$

slope $= -2$

normal

tangent $= \frac{1}{2}$

$\frac{1}{2} = \frac{y+2}{1-x}$

$y = \frac{1}{2}(1-x) - 2$

$y = \frac{1-x-4}{2} = \frac{-x-3}{2}$

$x\left(\frac{-x-3}{2}\right) + 2x - \left(\frac{-x-3}{2}\right) = 0$

$\frac{-x^2-3x}{2} + 2x + \frac{x+3}{2} = 0$

$-x^2 - 3x + 4x + x + 3 = 0$

$-x^2 + 2x + 3 = 0$

$x^2 - 2x - 3 = 0$

$(x-3)(x+1) = 0$

$x = -1, 3$

$x = -1: \frac{1-3}{2} = \frac{-2}{2} = -1$

$x = 3: \frac{-3-3}{2} = \frac{-6}{2} = -3$

$y = -2(x+1) - 1 = \boxed{-2x - 3}$

$y = -2(x-3) - 3 = \boxed{-2x + 3}$

53 $v = 8\sqrt{5-t} + 1$

show $a = 32\ t/s^2$

$v = 8(5-t)^{\frac{1}{2}} + 1$

$\frac{dv}{dt} = \text{accel.}$

$\frac{ds}{dt} = \text{vel.}$

$\frac{dv}{dt} = 4(5-t)^{-\frac{1}{2}} \cdot \left(1\frac{ds}{dt} - 1\right)$

$\frac{dv}{dt} = a = 4(5-t)^{-\frac{1}{2}} \cdot \left(8\sqrt{5-t} \cancel{+1} \cancel{-1}\right)$

$a = \frac{4 \cdot 8\sqrt{5-t}}{\sqrt{5-t}}$

$\boxed{a = 32\ ft/sec^2}$

Test ch. 3

- limit definition of derivatives (3.1)
- continuous vs. differentiable (corners, cusps, vert. tan., p.109)
- relating graphs of $f(x)$ and $f'(x)$
- finding tan + normal lines
- rules of differentiation
  - power
  - product
  - quotient
  - chain
  - Trig. functions
- Implicit differentiation
- Dist, vel., accel.
- higher order derivatives
- NDER on Calc. (p.111 B)

p.181 Do enough to prepare yourself

Not inverse trig. funct.

Not exponential or logarithmic

Not parametric